Pathfinder Honour:

Trainer's Notes

Map & Compass

Instructions to Trainers / Instructors of this Honour

Thankyou for being involved with this Honour. These notes have been developed to assist in teaching / instructing this honour. We recognise that there is much more information available and we are grateful that you should share your expertise.

Please remember that Honours are designed to develop our Pathfinders in many ways; their interests, their knowledge and their relationship with their Saviour and Creator. Your enthusiasm and creativity will have a huge impact on those doing the honour.

To complete an Honour, the following (where applicable) must be completed satisfactorily:

- Physical and Practical Requirements.
- Honour Workbook.
- Honour Assessment Sheet. *(On SPD Honour Website but Leader's level access is required)*

Additional Reference Material

Please see following text.

Acknowledgements

Based on SPD Map & Compass Honour Notes. Please see following text for other acknowledgements

Map & Compass Honour

SECTION 1: THE MAP

REQUIREMENT 1.1: Know the following:

a. What is a topographical map?

Topographic comes from two Greek words *"topos"* meaning 'place' and "*graphein"* meaning 'write' or 'draw': therefore, a topographic map is drawing of a section of the earth's surface.

They were originally produced by the Army and were known as military maps. Now they are the most widely used maps for bushwalking.

Topographic maps are produced from information obtained from aerial photographs. Cartographers take this information and produce these maps.
Topographic maps are usually very accurate.

b. What is found on a topographical map?

These maps show the formation and use of the land in the area mapped. This is achieved by using contour lines and conventional signs. The explanation of these signs is found in the Marginal Information of the map and includes:

- Contour lines - express the actual shape of the land.
- Legend - contains conventional signs that explain the features drawn on the map.
- Grid system – the system used to locate specific points on the map.
- Map Name and Reference - gives the map name and map identification info.
- Scale – usually shown as a representative fraction, eg 1:25,000. In this case, one part on the map represents 25,000 parts on the ground.
- Grid-Magnetic Angle - the angular difference between Grid North of the Grid system and Magnetic North (where the compass needle points).
- Height above sea level - spot heights are given for various points on the map.

c. Give three uses of a topographical map.

- Describes the land surface and shows the shape of the land; ie ridges, rivers, cliffs, valleys and spurs etc,
- Indicates position of roads, railways, houses etc. and other man made and natural features. It also can be used to locate your own position.
- Indicates direction - enables the calculation of a direction (bearing) from one feature to another.
- Indicates distance - enables the calculation of distance from one feature to another.

REQUIREMENT 1.2: What is an orthophoto map?

Orthophoto maps are very similar to topographic maps, and are produced using the aerial photographs as the background of the map with the symbols, including contour lines, overlayed.

These maps give a good indication of the type and density of the vegetation, but sometimes other details of the map suffer.

In some areas, only orthophoto maps are available for bushwalking.

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REQUIREMENT 1.3: Be able to recognize twenty signs and symbols found on a topographical map, giving some of each in the following categories:

a. Man made

These are usually shown in red or black. Railways, roads, fences, powerlines, bridges, tunnels, mines, quarries, windmills, buildings, churches, schools, ruins, trig stations.

b. Water feature

These are usually shown in blue. Rivers, creeks (perennial or intermittent), lakes, dams, tanks, swamps etc.

c. Vegetation feature

These are usually shown in green. Forests and scrub (dense, medium or scattered), plantations, orchards, vineyards, mangroves etc.

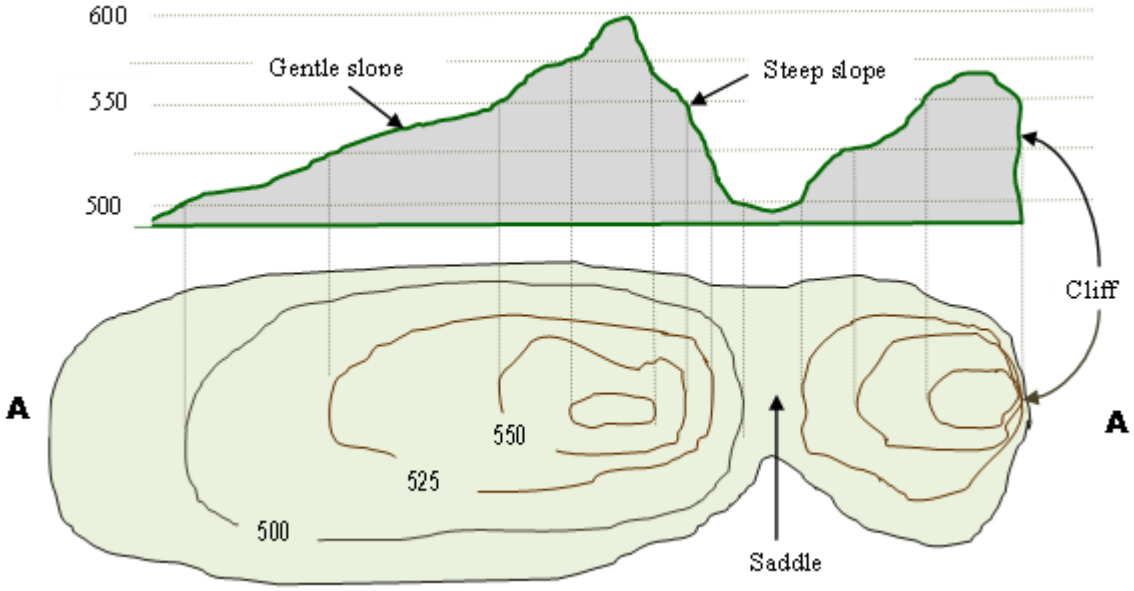
REQUIREMENT 1.4: Know and explain the following as they relate to elevation:

a. Contour lines

These are the lines drawn on the map (usually in brown), that pass through all points that are the same height above sea level.

Contour lines are always an unbroken line on the map. Hills, valleys, ridges etc. are described on the map by the shape of these lines.

The relationship of contour lines to the actual slope of the land is shown in the figure below.



b. Contour interval

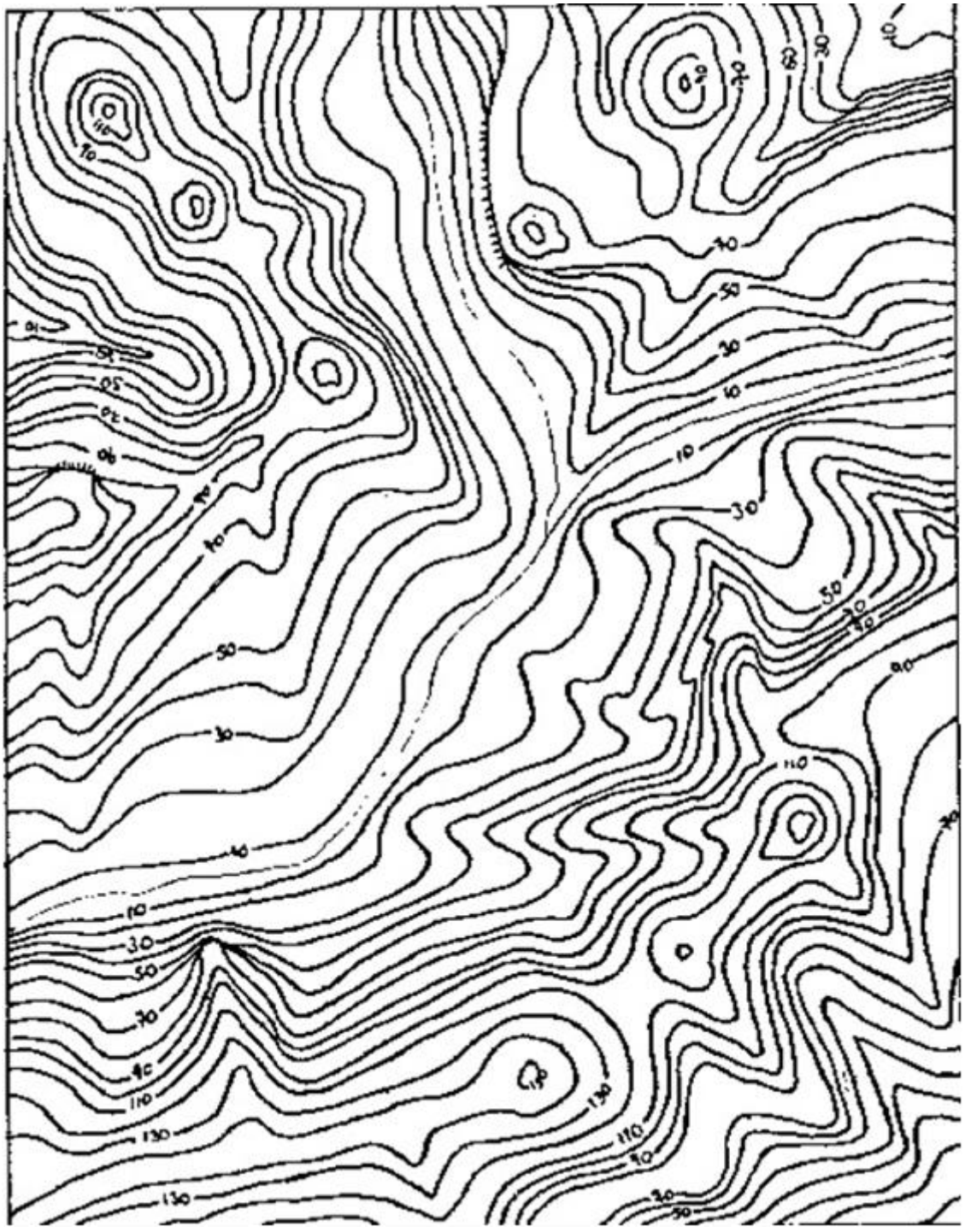
The vertical height between two contour lines in the contour interval. Thus, if you climb (or descend) a hill from one contour line on the map to the next, you have moved vertically a distance that is equal to the contour interval.

The contour interval is specified on each map and is found in the legend. It may also be calculated from the contour line elevations that are written on the map.

On maps drawn in Australia, the top of the number indicating the height above sea level shown on the contour line is pointing to the higher ground.

c. Ground formations (Valley, Ridge, Spur, Bluff or Cliff, Saddle, Shoulder, Escarpment, Knoll, Brow) identified by their contour lines.

The above-mentioned land formations are diagrammatically represented by contour line drawings in figure below.



Please see examples overleaf.

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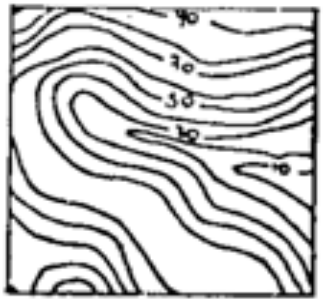
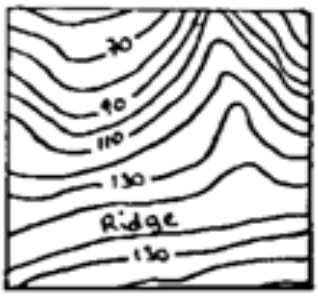
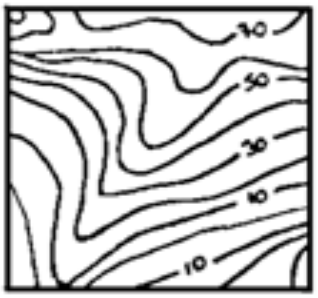


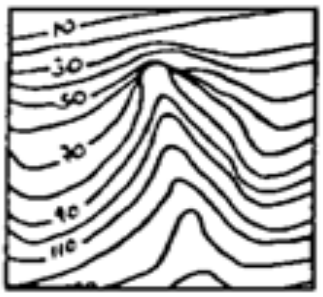
Valley - a depression between two hills, spurs, ridges or mountains.



Ridge - a long, narrow strip of highland, with a change in elevation no greater than one contour interval.

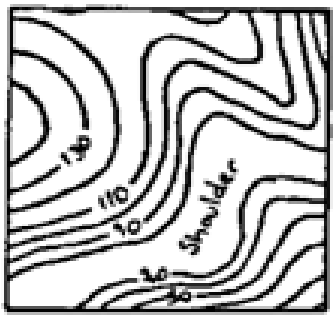


Spur - a narrow strip of land with decreasing contour line elevations, usually running from the end of a ridge down into a valley.

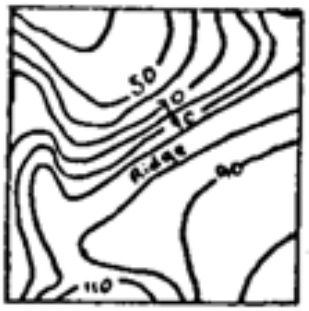


Bluff or Cliff - a broad, precipitous ending of a spur or ridge or headland, overlooking a valley or seacoast.

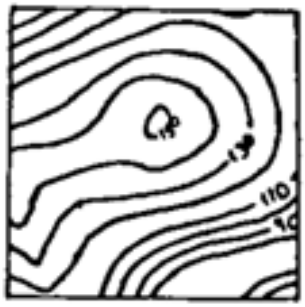
Saddle - a depression between two peaks.



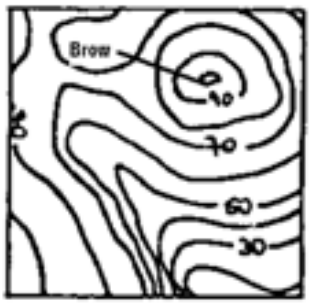
Shoulder - a broad flattened piece of land with steeper slopes above and below.



Escarpment - a ridge which has a steep slope on one side and a gentler slope on the other.



Knoll - a small detached hill. Maybe an outcrop on a ridge or spur etc.



Brow - the top of a steep slope before the summit is reached.

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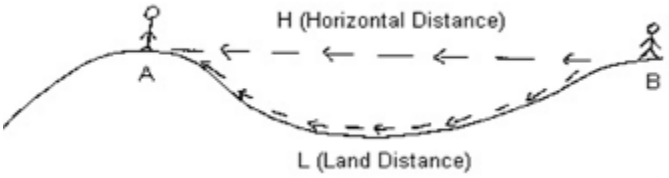
REQUIREMENT 1.5: Know and explain the following as they relate to distance:

a. How distance is defined.

The distance between points on a map, expressed in metres or kilometres, is a horizontal distance (*As the crow flies* distance).

This is not always a very accurate estimation of the amount of land (land distance) that has to be covered or the time required to travel between the two points.

The more undulating, hilly or mountainous the country, the greater the difference between the horizontal and land distances.



b. The map scale

The scale is the relationship of the horizontal distance between two points on the map and the horizontal distance between the two points on the ground.

Scale may be represented on a map in one or more of the following methods:

- A representative fraction - 1:25,000 means that for every one distance on the map is equal to 25,000 of the same distance on the ground.
- A linear scale drawn on the map which is usually found at the bottom of the map in the Marginal Info.
- A written statement, ie, so many centimetres to the kilometre.

c. How to measure linear distance.

Horizontal distances in a direct line between two points on a map can easily be calculated by measuring the distance between points with a ruler or by marking a piece of paper and then comparing it against the scale.

For distances between points where the best route is not a straight line, one way is to use a piece of string or cotton to trace around the proposed route. Another way is to use a sheet of paper and swivel the sheet and mark the bends etc along the edge of the sheet for the proposed route.

Then use the scale to determine the distance.

Horizontal distance can be converted to land distance (actual distance travelled).

d. How to estimate land distance.

The land distance can be estimated by the following:

L = H + (CI x n)

Where: L = land distance between points A & B
H = horizontal distance between points A & B
CI = contour interval of the map
n = number of contour lines crossed between points A & B

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REQUIREMENT 1.6: Know and explain the following as they relate to a map grid system:

a. What is the grid system?

The Australian map grid is a system of vertical and horizontal lines drawn over topographical maps and is related to latitude and longitude.

The distance between the lines depends on the scale of the map; typically 1000 metres.

The grid is used to identify points on a map.

There are two types of Grid References.

- The four-figure reference identifies the grid square in which a particular point is located.

  The particular square referenced is to the North of and East of the point at which the nominated grid lines intersect.
- The six-figure grid reference identifies a particular point within a grid square.

  Details of how to use a six-figure grid reference are given in the Marginal information on most maps that have the system.

The **North-South grid lines on the map are called EASTINGS** (because the grid numbers at each end of the line increase as they move towards the East).

The **East-West grid lines on the map are called NORTHINGS** (because the grid numbers at each end of the line increase as they move towards the North).

*Hint: The **EASTINGS equate to the 'x' axis** and the **NORTHINGS to the 'y' axis** of the Cartesian coordinates system.*

b. What is a six-figure grid reference?

A grid reference is a string of six figures used to locate a particular position on the map. The figures are two groups of three figures strung together.

The **first three figures refer to Eastings** and the **second set to Northings.**

The first two figures of each group nominate the grid lines used to identify the grid square in which the sought after position is located.

The third figure in each group is the approximate distance in 1/10ths both East and North across the identified grid square.

c. Rules for reading grid references

The rule for giving a grid reference is to give the **Eastings first** and then the **Northings second.**

When reading a six-figure grid reference always read the **first group of three figures as Eastings** and the **second group as Northings**.

When the grid-square is identified, use the third figure in the first group to establish an imaginary Easting line across the square.

Then repeat the process with the third figure of the second group to establish an imaginary Northing line.

Where the two lines intersect will be the sought-after point. For a 1000 metre grid, this will be within one hundred metres plus or minus of the point on the ground. See overleaf.

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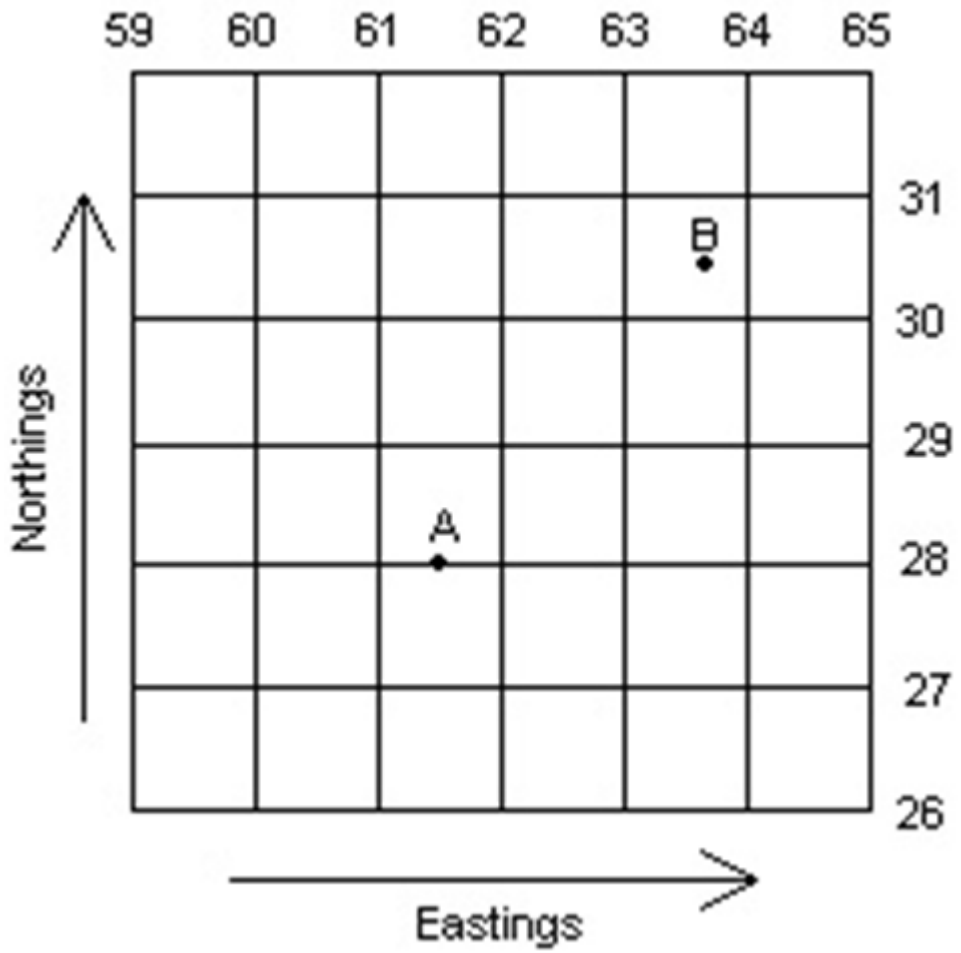

Point A would be 615280

Point B Grid reference would be 627304

The third number in each group of three is the position of the point between the grid lines.

Trainers. You are welcome to photocopy the above grid and use it to practice grid references.

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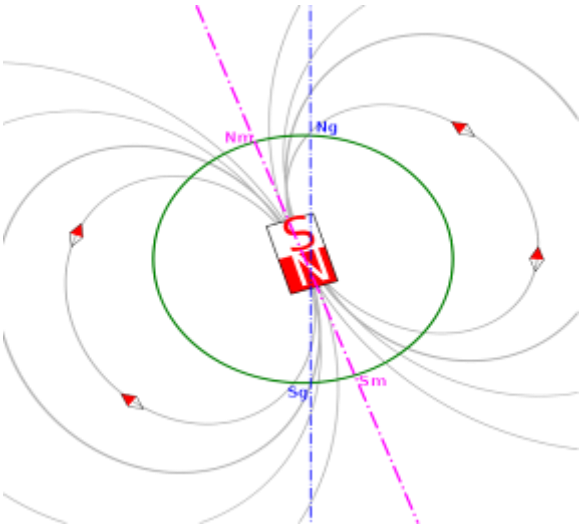
REQUIREMENT 1.7: Know and explain the following in relation to map reading:

Trainers, this page is included for further information. It is considered that if a student understands the big picture – what is actually happening with magnetic lines of force etc – terms such as Grid North and True North will make more sense.

The earth can be considered as a huge rotating ball (coloured green in the diagram) with slightly flattened ends and bulging centre. The imaginary axis (dotted blue line), about which the earth rotates, comes out at the North Geographic Pole (Ng) and at the South Geographic Pole (Sg).

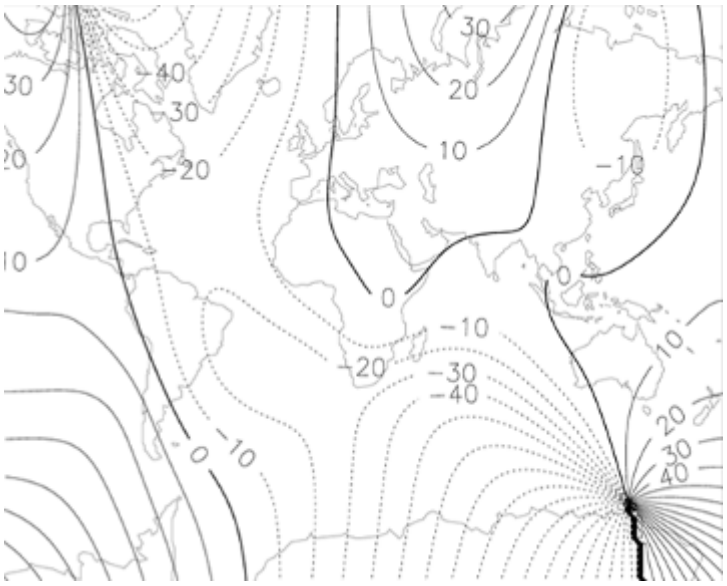


The earth is also a huge magnet. Like any other magnet, it has magnetic lines of force. By definition these magnetic lines of force point directly upwards at the magnetic poles - North Magnetic Pole (Nm) and South Magnetic Pole (Ns).

The Magnetic Pole (Nm) is sometimes called the north-seeking pole. That is the North Pole (the red part of a compass needle) will 'hitch a ride' on the magnetic lines of force and point towards the North Magnetic Pole. See the representations of a compass on the diagram.

Diagram source: http://en.wikipedia.org/wiki/File:Geomagnetisme.svg

If that isn't complicated enough, the magnetic poles are moving all the time – around 5 km per year for the South Magnetic Pole. The earth is molten inside and we are constantly subjected to solar winds.



To make matters even more complicated, these magnetic lines 'wobble' all over the place as well as change over time. Look at the diagram drawn in 2000. In Western Australia, a compass needle points directly to the North Magnet Pole, but in Eastern Australia it points about 10^0 to the east. *Diagram source*: http://en.wikipedia.org/wiki/File:IGRF_2000_magnetic_declination.gif

An interesting footnote is that a big reason for Able Tasman's trip in the 1640's was to chart these magnetic lines of force. He 'discovered' Tasmania and New Zealand.

Now that we have discussed the Geographic and Magnetic Poles, we need to look at how cartographers draw maps to suit the 'big ball' shape of the earth. There are many ways to do this. In our case they use a square grid pattern and these squares need to be adjusted slightly to 'fit' the spherical shape of the earth.

If you are confused and lost, take heart. Map makers have come up with solutions.

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a. Grid North

The top of all topographical maps drawn in Australia is to the north.

The North South grid lines (Eastings) drawn on the map point to Grid North.

On some modern maps the grid lines are drawn so that Grid North is the same as True North but this is not always the case.

The degree difference between Grid North and True North (Geographic North) is called the Grid Convergence and is usually very small and can be ignored if hiking.

b. True North.

True north is the direction of the North Geographic Pole.

This corresponds very closely to the Grid North of the map.

This can be determined by checking the North arrows on the map.

c. Magnetic North

Magnetic North is the direction to which the needle of the compass points.

d. Magnetic Declination.

As stated previously, a compass needle aligns itself with the earth's magnetic lines of force passing through that place. A compass needle only points to True North in very few places. See the diagram on the previous page.

The difference between True North and Magnetic North is called the Magnetic Declination.

In Australia, Magnetic North only coincides with True North at places where Magnetic Declination is zero. See figure on previous page.

Check out: http://www.magnetic-declination.com/ All you do is click on the place of interest anywhere in the world. Here are some examples as at June 2010:

Place	Magnetic declination	Place	Magnetic declination
Perth West Aust	1° 34' West: Negative	Auckland NZ	19° 32' East: Positive
Melbourne, Vic	11° 38' East: Positive	Invercargill, NZ	25° 8' East: Positive
Hobart, Tas	15° 1' East: Positive	Suva, Fiji	12° 25' East: Positive
Sydney, NSW	12° 44' East: Positive	Port Moresby, PNG	6° 20' East: Positive
Brisbane, Qld	11° 13' East: Positive	Papeete, Tahiti	12° 51' East: Positive

As can be seen, magnetic declination varies from place to place. In New Zealand it varies from about 20^0 in the top of the North Island to about 25^0 at the bottom of the South Island. See http://www.teara.govt.nz/en/magnetic-field/1/4

e. Grid Magnetic Angle (ie G-MA or GMA).

The G-MA (or sometimes referred to as GMA) is the angular difference between Grid North and Magnetic North. On some maps where Grid North and True North are the same, the magnetic declination and G-MA are the same.

G-MA varies with time, so most maps quote a value for a specific year and the annual change. This change (1 degree in about 20-30 years) is small but needs to be considered.

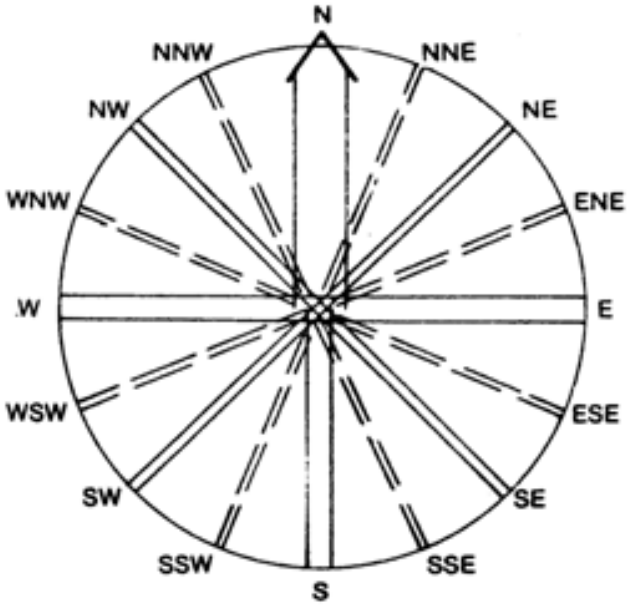
Map & Compass Honour

SECTION 2: THE COMPASS

REQUIREMENT 2.1: What are the 8 major points of the compass and their bearings?

The major points are listed in bold type. Other points are included for reference.

North (N).....	**360 or 0**
North-northeast....	22.5
Northeast (NE)...	**45.0**
East-northeast.....	67.5
East (E).....	**90.0**
East-southeast.....	112.5
Southeast (SE).....	**135.0**
South-southeast....	157.5
South (S).....	**180.0**
South-southwest...	202.5
Southwest (SW)..	**225.0**
West-southwest....	247.5
West (W).....	**270.0**
West-northwest....	292.5
Northwest (NW).	**315.0**
North-northwest...	337.5



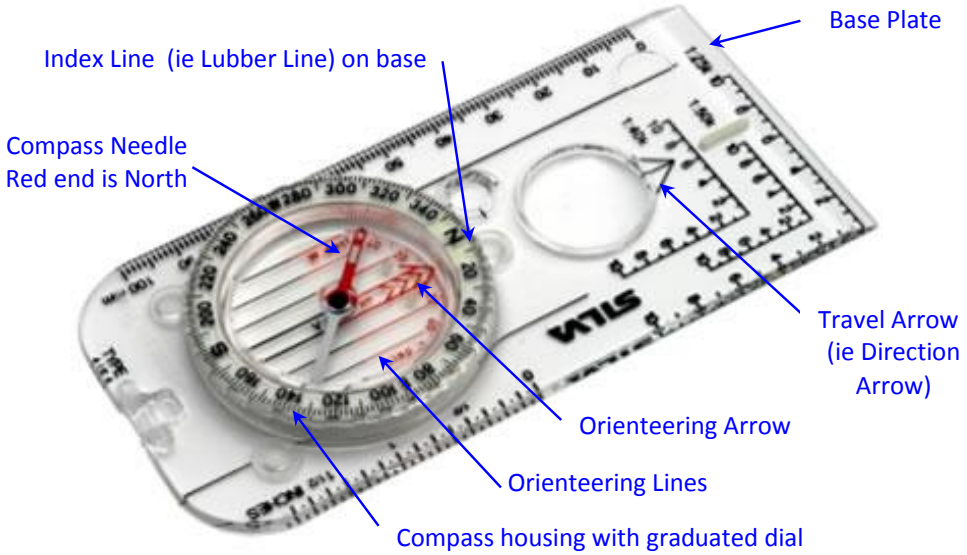
REQUIREMENT 2.2: Identify the type of compass most popular with bushwalkers.

There are many types of compass, but the one almost universally used in the bush employs a swinging needle within an adjustable dial. The best known example is the "Silva" brand of orienteering compass shown in Requirement 2.3.

Compass needles are balanced to swing freely in a horizontal plane. The balancing is different in the Northern and Southern Hemisphere. Ensure your compass suits your area.

Since the compass needle is magnetic, it should not be stored near large masses of iron or other magnets such as found in loud-speaker.

REQUIREMENT 2.3: Know the parts of an orienteering compass



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REQUIREMENT 2.4: Know and explain the following as they relate to Grid Bearings and Magnetic Bearings

a. What are Bearings?

- A direction expressed in degrees and measured from North is called a bearing.
- When quoting a bearing it must be stated from which North it is to be measured, whether Grid or Magnetic eg, 243 degrees Grid.
- Grid bearings are the direction from point A to point B as shown on the map.
- G-MA must be considered when converting from grid to magnetic bearings
- Magnetic bearings are used to take a bearing from a position to an observed feature. This bearing can then be followed without reference to the G-MA.

b. How to calculate a Grid Bearing from the map

- The grid bearing calculated from the map and converted to a magnetic bearing and set on a compass will guide travel to the desired land feature, which is not in view, or may go out of view during travel.
- The setting process ignores the magnetic needle and uses the compass base and housing as a protractor.
- The steps are as follows:
  Step 1:
  - Place the long edge of the compass along the line towards the desired destination.
  - Ensure that the direction of travel arrow points towards the desired destination.
  - Disregard the compass needle.

  Step 2:
  - Hold the compass base on the map and turn the compass housing until the orienting arrow is parallel with the grid lines and points to Grid North.
  - Read the number of degrees at the index line.
  - This number is the grid bearing.

c. How to convert a Grid Bearing to a Magnetic Bearing

Step 1:

- Correct for G-MA.
- For areas East of G-MA "0" line (approximately through Kalgoolie), draw a diagram showing Grid North with Magnetic North to the East or right side and the direction of line at approximately the number of degrees to the East of grid north.
- Remember that Grid North is "0" degrees and all measurements are East of it. Calculate the current Magnetic Declination from the information contained in the margin of the map.
- Do not forget to consider the annual change.
- Using the figure from the above calculation, calculate the Magnetic Bearing as follows:

  MB = (GB – MD) When MB = Magnetic Bearing
  GB = Grid Bearing
  MD = Magnetic Declination

- Hold the base plate and turn the housing to adjust the Bearing from Grid to Magnetic at the index line.

Step 2:

- When the compass is set to the magnetic bearing, hold the compass at waist, in the palm of the hand.
- Ensure there is no local magnetic attraction, eg, belt buckle, wrist watch, car or power line etc.
- Point the direction of travel arrow directly ahead.
- Turn until the north end of the compass needle aligns over the orienting arrow.
- The direction to proceed (or look) is now indicated by the direction of travel arrow on the compass.

d. How to convert a Magnetic Bearing to a Grid Bearing

- Usually used to locate a land feature on the map.
- Take a magnetic bearing on the land feature and convert it to a grid bearing by following the above steps in reverse.

e. How to take and march on a Magnetic Bearing

- To take a magnetic bearing,
- Point the direction of travel arrow towards the desired feature.
- Rotate the compass housing until the orienting arrow is directly below the magnetic needle.
- The number indicated at the index line is the magnetic bearing .
- The bearing may then be followed by ensuring the orienting arrow is in line with the magnetic needle.

f. What is Slipping and how to correct for it

- When travelling on a magnetic bearing various obstacles can push the party off course by forcing the deviation from the original route.
- If the original compass bearing is followed, the party will not be on the correct course, but rather on a parallel course.
- This error is called 'slipping.'
- If the starting point is in view, slipping can be corrected by:
- Hold the compass in the palm of the hand with the original bearing unchanged.
- Turn around until the south end of the compass needle is aligned over the orienting arrow.
- Move sideways with south end of the needle and the orienting arrow lined up, until the travel arrow points to the starting point.
- The party is then on course.
- If the starting point is not in view, it will be necessary to do a resection to locate the present position of the party.

g. How to take a Back Bearing

- When following a compass bearing towards some feature, the bearing in the reverse direction is called a back bearing
- The back bearing and is simply 180 degrees different from the forward bearing.
- Add or subtract 180 degrees to or from the forward bearing, depending on whether the forward bearing is greater or less than 180 degrees.

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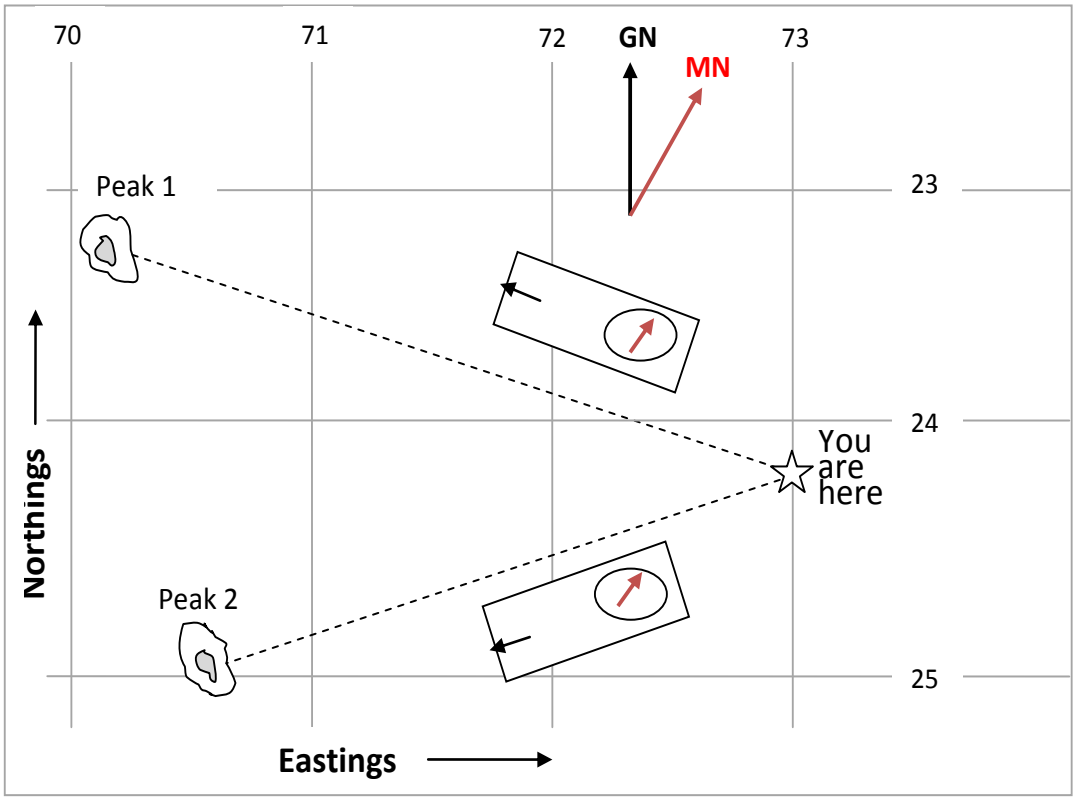
REQUIREMENT 2.5: Know and explain the following as they relate to Resection

a. What is Resection

Resection is a method used to locate a position on a map. It is useful for locating the correct position after 'slipping' or to confirm a position if there is uncertainty relative to its location on the ground.

b. The two-bearing method of Resection

- Identify two landmarks, eg. peaks, that can be unmistakably identified on the map.
- Take a magnetic bearing on one peak and convert it to a grid bearing.
- Remember G-MA must be taken into account when converting the magnetic bearing to a grid bearing for resection to be accurate.
- Repeat the process relative to the other peak.
- Draw the line of each grid bearing on the map.
- The intersection of the two lines will be correct position.



c. The one-bearing method of Resection

- When the positioned on a linear feature eg. river, track or road, only one bearing from an identifiable feature is needed to establish the correct position, provided the linear feature does not meander significantly.
- Take a magnetic bearing on the feature and convert it to grid bearing.
- Remember G-MA must be taken into account when converting the magnetic bearing to a grid bearing for resection to be accurate
- Draw the line of the grid bearing on the map.
- The correct position is where the line crosses the linear feature.

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REQUIREMENT 2.6: Orient your map by inspection and by using a compass.

Before undertaking any navigation with the map alone, it is necessary to orient the map. That is to rotate the map so that the North on the map points to the North. This correctly juxtaposes the features on the ground with their representation on the map.

a. By observation

- When the starting position is known, and nearby landmarks can be identified, the map can be oriented by observation.
- Locate the landmark on the map.
- Connect the landmark position and the current position on the map with a pencil or stick etc. Turn the map about the point marking the current position, until the pencil points to the actual landmark.
- The map is then oriented.
- Orienting a map by observation is not always accurate (it is dependent upon the capability of the operator and G-MA)
- It should only be used when a compass is not available.

b. By using a compass

- Determine G-MA of the map.
- Set North (0 Degrees) on your compass to the index line.
- Set the compass housing to the G-MA so that the compass replicates the north arrow diagram: that is, the direction of travel arrow points generally along the grid north arrow and the orienting arrow points generally along the magnetic arrow.
- Leaving the compass set, place it anywhere on the map with the long edge along one of the grid lines and with the direction of travel arrow pointing to Grid North. Disregard the compass needle.
- Without moving the compass, rotate the map until the North end of the compass needle aligns over the orienting arrow.

Map & Compass Honour

SECTION 3: DIRECTION WITHOUT THE AID OF A COMPASS

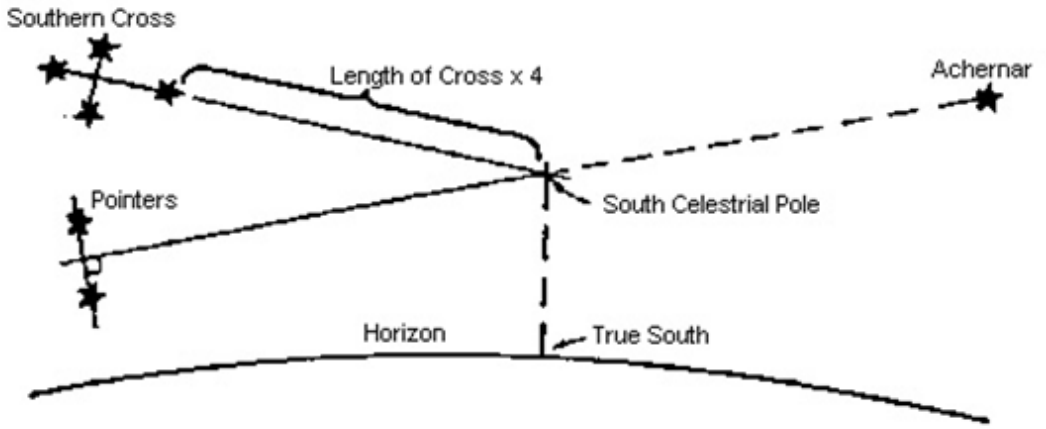
Everyone hiking in the bush with a map should carry a compass, but what happens if the compass gets lost or damaged. Often only rough indicators of direction are needed and without a compass, that is often all that you get. Southern Hemisphere methods follow.

REQUIREMENT 3.1: Demonstrate how to find directions without the aid of a compass using the Southern Cross (ie Crux) method

Southern Cross (ie Crux) method

The position of the Southern Celestial Pole can be located in the sky using the Southern Cross by:

- Method 1: Finding a point half way between the Pointers and Achernar.
- Method 2: Extending the axis of the Southern Cross four times the length of the cross from the star at the bottom.
- Method 3: At the intersection of the perpendicular bisector of the line joining the pointers and the axis of the cross extended.
- Point to the South Celestial Pole and then drop the hand to the horizon directly in front.
- The position on the horizon will be South from the observer.



Watch method (Note this method is included for reference only)

It should be noted that the watch method is reasonably accurate for a few weeks at mid winter in Australia and New Zealand. However, it is liable to errors of at least 30 degrees in midsummer and up to 180 degrees in the tropics. Here's what to do.

- Point the twelve at the sun.
- Note the time of day that you are doing this. Draw/imagine a line which passes through the centre of the watch and is midway between the hour hand and the twelve. This line points to the North. Note that, if you are running on daylight saving time, use 1 o'clock instead of the 12 o'clock
- If you have a digital watch imagine the position of the twelve on the watch face and operate as an analogue watch.

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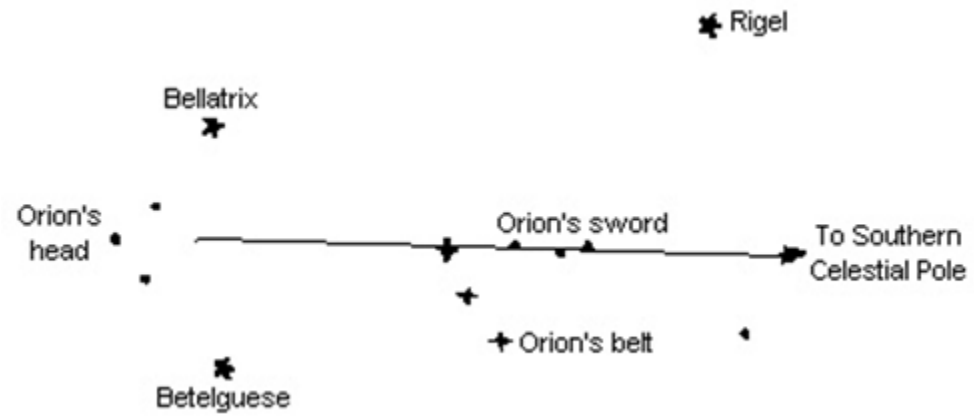
Orion method (Note this method is included for reference only)

The Southern Celestial Pole can be located in the sky using the Orion by

- A line drawn through Orion's head and sword points to the Southern Celestial Pole. Extend this imaginary line through the sword, across the sky to a point that is about 35 degrees above the horizon.
- This is the South Celestial Pole.
- Point to the South Celestial Pole and then drop the hand to the horizon directly in front.
- The position on the horizon will be South from the observer.



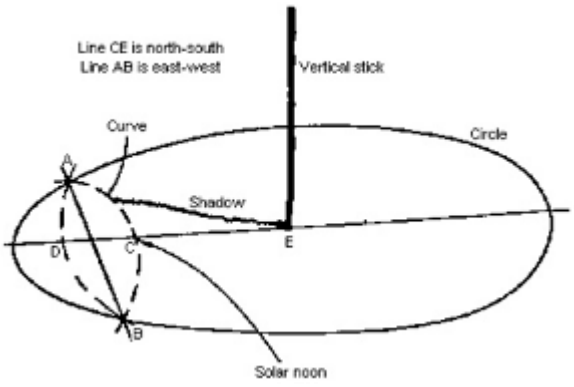
Shadow Stick method (Note this method is included for reference only)

Solar noon and midnight can be determined by observing the shadow cast by a vertical stick.

The shadow of the tip of the stick will plot a curve on flat ground, either concave or convex to the stick.

Solar noon occurs approximately when the shadow is the shortest.

This method can also be used to plot an east-west or north-south line.



- Place a stick (about 1m tall) vertically in flat ground
- Approximately every 15 minutes for up to two hours before and after noon, mark the spot of the tip of the shadow.
- Draw a curve through the points (A to C to B)
- Using a piece of cord, and with point E as the centre, draw a circle to cut the curve A-C-B. The points where the circle cuts the curve are A and B
- Draw a straight line from A to B. This is the east-west line
- A line drawn perpendicular to A and B and bisecting A-B to E is the north – south line

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SECTION 4: PRACTICAL

With the exception of Requirement 4.3 all of the following practical requirements are covered in previous requirements.

REQUIREMENT 4.1: Demonstrate how to

a. **Read six-figure Grid References.** Refer Requirement 1.6c.
b. **Calculate a Grid Bearing from the map.** Refer Requirement 2.4b.
c. **Convert Grid bearing to a Magnetic Bearing.** Refer Requirement 2.4c.
d. **Take a Magnetic Bearing.** Refer Requirement 2.4e.
e. **Locate a position using Resection.** Refer Requirement 2.5.

REQUIREMENT 4.2: Navigate to a target feature using a Magnetic Bearing.
Refer Requirement 2.4e.

REQUIREMENT 4.3: Prove your ability in the use of a map and compass by following a cross-country course with at least ten given readings or control points. Keep a log detailing:

- **Grid references,**
- **Grid and magnetic bearings,**
- **Records of actual course taken.**

Trainers, please remember that the purpose of this requirement is to ensure that those doing the honour are competent in using a map and compass. It is not a test of physical endurance. We have not stipulated a distance for the course. This allows you to use your God-given creativity to set out the best course to achieve the aims of this requirement. In setting out the course and running the activity, please:

- Make sure that appropriate safety provisions are in place and adhered to.
- Ensure that most of the control points are not be visible from the previous one. That is they are obscured by hills, vegetation, buildings etc.
- Challenge the skills of the participants by having some of the control points a reasonable distance apart, say several hundred metres.
- Consider making the activity more interesting by having ‘rewards’ etc at some control points, but don’t overdo it. The activity is a test of map and compass skills.
- Provide adequate supervision and;
- Most of all have fun!